

NAVAL WAR COLLEGE
Newport, R.I.

**ADVANCED TECHNOLOGY
AND THE
FUTURE OF COMMAND AND CONTROL**

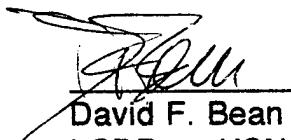
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A paper submitted to the Faculty of the Naval War College in partial satisfaction
of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not
necessarily endorsed by the Naval War College or the Department of the Navy.

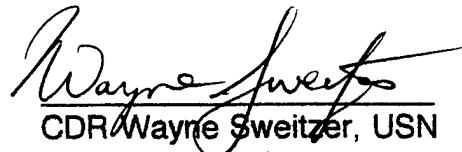


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15 November 1997

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DTIC QUALITY INSPECTED 4



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19970520 108

UNCLASSIFIED

Security Classification This Page

REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED			
2. Security Classification Authority:			
3. Declassification/Downgrading Schedule:			
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT			
6. Office Symbol: NWC Code 1C	7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207		
8. Title (Include Security Classification): Advanced Technology and the Future of Command and Control (u)			
9. Personal Authors: LCDR D.F. Bean, USN			
10. Type of Report: FINAL	11. Date of Report: 07 FEB 1997		
12. Page Count: 27 Pages <u>18</u>			
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.			
14. Ten key words that relate to your paper: Command and Control, C4I, Revolution in Military Affairs, Task-Oriented Orders			
15. Abstract: Sophisticated command, control, communication, and computer systems are the focus of much attention as the nation's military looks forward to the 21st century. The technology is conceivable and realistic and there is a concerted effort to acquire it, as seen through the efforts of the Joint Resources Oversight Council and others. But is the Warrior ready for the fundamental changes that these new systems may bring? A number of concerns have been raised regarding the integration of that technology. Improved collection, analysis, and dissemination systems will help a commander develop unprecedented battlespace awareness, but also carry the potential for substantial problems. In particular, what will become of the principle of decentralized execution when a commander possesses a near-perfect picture of the battlespace? It often takes a leader with a strong constitution to keep from interfering with his subordinates under those conditions. The successful introduction of new technology is directly dependent on the development of doctrine which will govern its use, and organizational changes which recognize the fundamental difference it will make in warfighting. A thorough examination of existing and planned service doctrine should reveal the extent to which the U.S. Armed Forces are ready to leap into cyberspace.			
16. Distribution / Availability of Abstract:	Unclassified XXX	Same As Rpt	DTIC Users
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841-6461	20. Office Symbol:	1C	

**ADVANCED TECHNOLOGY
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FUTURE OF COMMAND AND CONTROL**

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07 FEB 1997**

ABSTRACT

Since Operation DESERT STORM, the military community has been engaged in a wide-ranging dialog regarding introduction of advanced technology to the battlefield. Much of this discussion has focused on sophisticated command, control, communication, and computer systems and their effect on the manner in which the United States wages war. The ongoing 'C4I For The Warrior' program (C4IFTW) is a living reminder of the direction in which the armed services are moving. C4IFTW carries with it a "...vision of providing for the Warrior, at any time and any place, a fused real-time, true representation of the Warrior's battlespace..."¹ The technology is conceivable and realistic, and there is a concerted effort by our government and military to acquire it. But is the Warrior ready for it?

A number of concerns have been raised regarding the integration of this technology. Improved collection, analysis, and dissemination systems will help a commander develop unprecedented battlespace awareness, but also carry the potential for substantial problems. In particular, what will become of the principle of decentralized execution when a commander possesses a near-perfect picture of the battlespace? It often takes a commander with a strong constitution to keep from interfering with his subordinates under those conditions.

The successful introduction of new technology is directly dependent on the development of doctrine which will govern its use, and organizational changes which recognize the fundamental difference it will make in warfighting. A thorough examination of existing and planned service doctrine should reveal the extent to which the U.S. Armed Forces are ready to leap into cyberspace.

¹ Joint Chiefs of Staff, *C4I For The Warrior*, (Washington: GPO, 1993), 2.

WE HAVE SEEN THE FUTURE

Revolution or evolution: how should the integration of advanced communication and decision systems into the business of waging war be labeled? A question posed throughout the pages of professional military publications since Operation DESERT STORM, it is today largely academic. Rather than tangle with discerning that distinction, the military community must seek the proper way to integrate those systems into their warfighting plans. Embodied in such programs as 'C4I for the Warrior,' computer-based communication networks are now a fact; they will be integral to all U.S. military operations (war, and operations other than war) in the future. What they bring is more than simply an improved means of talking between units. These new systems promise to meet "...the warrior's need for a fused, real-time true picture of the battle space and the need for the ability to order, respond, and coordinate vertically and horizontally to the degree necessary to prosecute the mission in the battle space."¹ The technology exists to meet that vision; what is less certain is the military's ability to integrate it successfully.

Absent a strong enabling doctrine, the full potential of any technological improvements will never be reached. In the case of Command, Control, Communications, and Computer and Intelligence (C4I) systems, increased speed, timeliness, and accuracy may have serious detrimental consequences if integrating doctrine is not in place. Will improved access to real-time battlespace information at all levels yield better coordination between units at the tactical level, allowing them to operate with more autonomy? Or will it simply entice an

Operational Commander to intervene in the decisions of his subordinates, directing their movements from afar? Increased centralization of command resulting from the battlefield integration of advanced C4I systems is a very real problem which demands attention.

THE POSSIBILITIES

The earliest ideas relating to battlefield use of advanced technology and the changes it would bring can be traced to Soviet military thought in the 1980s. Yet it took Operation DESERT STORM to energize theorists in the United States into addressing that potential. A 1993 study by the Center for Strategic and International Studies (CSIS), for example, sought to provide direction for U.S. forces seeking to capitalize on technological advances. It noted that "(t)ogether, advanced surveillance and command systems create the potential for individual commanders to see the entire battlefield and to direct units and fire at will."² Seeking to realize that potential, the U.S. military has since focused on improving C4I systems through the integration of commercially available technology.

C4I For The Warrior (C4IIFTW), directed by the C4 Systems Directorate (J6) of the Joint Staff, is the umbrella program for efforts to design and implement the system described in that CSIS report. It envisions a network fully operable between the service branches, distributing information both horizontally and vertically and facilitating the joint operations that will characterize military action of the future. When fully implemented, C4IIFTW will consist of an open system architecture "...that will provide virtual connectivity from anywhere to

anywhere instantaneously on demand."³ Development of that extensive system is well underway; the Global Command and Control System (GCCS), a foundation of the C4IFTW program, is now largely in place. The role that advanced technology will play in the armed forces of the 21st century simply cannot be ignored, a sense of inevitability resident even at the joint level: "(i)nformation technology and the existence and growth of a global infosphere have *irreversibly* impacted the fundamental approach to warfare of massing efforts rather than forces."⁴ What must now be addressed are the host of potential problems related to the introduction of the new systems.

THE FUTURE OF DECENTRALIZED EXECUTION

"That the modern field marshal can sit invisibly in the cockpit with a pilot or perch cybernetically in the hatch of a tank commander raises a profound problem of centralization of authority. Although all military organizations pay lip service to delegation of maximum authority to the lowest levels of command, few military leaders can resist the temptation to dabble in their subordinates' business."⁵

Decentralized execution has been a fundamental tenet of U.S. warfighting for many years. Directly related to the German **Auftragstaktik** (task-oriented orders), this is a command form characterized by substantial delegation of authority and freedom of action; subordinates are instructed *what* to do, but not *how* to do it. Key to success under decentralized execution is the initiative and courage of subordinate commanders, which fosters the requisite flexibility for responding to uncertain, rapidly changing battlefield conditions. What then happens when that same battlefield is invested with a digital command and control architecture, providing virtually all participants with an

accurate, real-time vision of the battlespace? The consequences of such an architecture could easily include the end of American task orientation. For example, a commander possessing such timely information may feel that the element of uncertainty is largely erased, giving him Dominant Battlespace Awareness (DBA). Absent the traditional fog of battle, will decentralized execution be seen as even necessary? More importantly, what is the likelihood of micromanagement under an architecture which its visionaries promise will provide 'NCA to foxhole' connectivity? Will a commander be able to detach himself from providing tactical orders to a subordinate if he is able to view that subordinate's actions as they transpire?

With the latter circumstances particularly in mind, consider the implications of the 'zero defect' mentality that many pundits feel currently pervades the military. If such a mindset is indeed prevalent, it's conceivable that an operational commander, unable to tolerate tactical miscues on the part of his subordinate, will not hesitate to intercede on that lower level. Specific directions would surely be forthcoming, where once only broader orders sufficed. Over time, those circumstances would lead to one of two results: a subordinate who comes to rely wholly on orders from above and whose own initiative atrophies, or one who consciously chooses to cut himself off from the C4 network and rely on his own judgement. Neither of these would be to the ultimate benefit of the force as a whole.

Author Martin Van Creveld has noted historical precedents for the problematic integration of communications technology. He suggests an "unending struggle" to clear the fog of war,

likening that tension to a market for information in which supply never quite meets demand. Characteristics of his "information pathology" include an evolving demand for certainty and a growing centralization of command. In describing the advent of earlier advances in communication capabilities, Van Creveld notes that with the introduction of the telephone in World War I, the Germans fell victim to "...telephonitis, a tendency by higher headquarters to interfere in every small detail simply because it was so easily done."⁶

A MUTUAL DEPENDENCY

U.S. Military leaders are committed to the thorough integration of advanced C4 systems, yet the decision may be injurious to a principle warfighting tenet. Is any action possible which may forestall that decline? Hand in hand with technological development must come the institution of doctrine which seeks to smooth its integration. Without one, there cannot be the other. As two key proponents of advanced communication systems have noted, "...developing the concepts of operations that incorporate new technologies and organizations to permit effective exploitation of new capabilities is even more critical than acquisition of the technologies themselves."⁷

The symbiotic relationship between doctrine and new technology is well established in history. Perhaps the best known example is the introduction of *Blitzkrieg* in 1939. While both German and French armies had developed high quality tanks during the interwar period, it was the *Wehrmacht's* dedication to the development of implementing doctrine that allowed it alone amongst the combatants to successfully integrate the new machines. Using mobile armored equipment that was not

necessarily superior to that of their opponents, German forces handily defeated French and British troops arrayed against them. Historians have pointed to German decentralization of tactical decision-making as a critical element in the doctrinal design which fostered that success.⁸

How well prepared is the U.S. Military to integrate the new C4 systems which are being introduced? A review of service programs and doctrine offers the most concrete evidence of preparedness. *Navy Doctrine Publication 6, Naval Command and Control*, directly addresses technological advances in the information age. It recognizes that 'fog' and 'friction' are immutable facts of war, and assumes that perfect knowledge is unattainable. Yet it directs a continuing reassessment of the service's ability to dissipate that fog using improved technology.

NDP 6 also provides a set of terms describing two types of command and control (C2)--detailed and mission control--which frame the analysis. The latter equates directly with the concept of decentralized command: a subordinate commander free to exercise his own tactical judgement to achieve his superior commander's intent. It is this 'mission' control which is preferred under conditions of uncertainty and time limits. At the same time, Navy doctrine articulates the difficult decision a commander must make, balancing his own desire to provide specific direction under disorderly conditions with the need to provide his subordinates the freedom of action which more effectively counters that disorder. Finally, the Navy document addresses the problematic integration of advanced C4 systems:

"(E)ven though new technologies now allow senior

leadership to direct operations from afar, we still must give the on-scene commander the freedom of action to exercise initiative based on his knowledge of the local situation. This is an essential element of our command and control philosophy."⁹

The Army enjoys a long-standing reputation for the development and implementation of doctrine; it has also taken positive steps to integrate advanced C4 systems with its vision of warfare in the 21st century. As with its Navy counterpart, the Army perspective also reveals recognition of the need to accept uncertainty in battle in spite of improved availability of information technology. Still, Army shares the vision of a digitized battlespace which "...permits commanders at every level to share a *common, relevant picture* of the battlefield scaled to their level of interest and tailored to their special needs."¹⁰ 'Scaling' and 'tailoring' of the battlespace picture by a commander may provide a physical means to assure mission-, or task-oriented orders. Also suggested is a system of traditional hierarchical information structures and more flexible ones linked on an internet; such an architecture would relegate some orders to the traditional net, while allowing 'demand pull' to drive the other¹¹. This design should facilitate direct coordination between combatants while allowing higher echelons to monitor their subordinates and focus attention on influencing the battlespace on a larger scale.

If Army doctrine offers some specific structural methods of resolving potential micromanagement, it also acknowledges directly that C4 architectures are an evolving field. By implication the service must remain flexible enough to change doctrine as required. Yet in spite of proposed doctrinal changes, decentralized execution remains a basic tenet:

"Future Army leaders must be able to fully exploit the opportunities that command systems...provide. They cannot use these systems to second-guess or interfere with the command prerogatives of subordinate commanders. They must have such intuitive skills as vision, innovation, adaptability, and creativity and the ability to simplify complexities and clarify ambiguities--all while operating under stress."¹²

Marine Corps doctrine, though written nearly eight years ago, was remarkably prescient with respect to the integration of communications technology. The inherent disorderliness of war, and the need for decentralized command figures prominently in the basic warfighting tenets described in Fleet Marine Force Manual 1; remarkably, the Marines had it right well ahead of DESERT STORM:

"...our philosophy of command must be based on human characteristics rather than on equipment or procedures. Communications equipment and command and staff procedures can enhance our ability to command, but they must not be used to replace the human element of command."¹³

Individual service doctrine seems collectively committed to the principle of decentralized execution. Can the same be said of Joint doctrine? Not surprisingly, the view of future warfare outlined in *Joint Vision 2010* mirrors the perspectives held by component forces. Emphasis lies on gaining DBA through advanced C4 systems, while acknowledging the constancy of friction and fog. Designed specifically as a 'template' for translating technological advances into operational capabilities, *Joint Vision 2010* correctly ascribes a certain duality to that technology. It notes the degree of independence that DBA can give to lower echelons, while also stating that "...commanders at higher echelons will use these technologies to reduce the friction of war and to apply precise centralized control when and where appropriate."¹⁴ Significant in this assertion is the

implicit and critical role that the superior commander will play--he will determine the appropriate moment to focus control in his own hands. The framework outlined in *Joint Vision 2010* ultimately suggests the need for balance when integrating technology, noting that "...regardless of how sophisticated technology becomes, the individual warfighter's judgement, creativity, and adaptability in the face of highly dynamic situations will be essential to the success of future joint operations."¹⁵

Though no single Joint publication directly addresses the impact on decentralized execution of integrating advanced C4 systems, they do when taken as a whole. What emerges is a set of guidelines which invest the Joint Force Commander with responsibility for the structure of the C4 system that his forces will use, determining which information may be 'pulled' through that system, and prioritization of information distribution. With that charter, the JFC becomes the focus for ensuring that decentralization remains a fundamental method of guiding his forces. In so doing he is particularly encouraged to "...scrupulously avoid overly detailed management and direction."¹⁶ Additionally, doctrine posits that while advanced communications systems allow an operational commander to exploit tactical success, "...command style is dictated by the commander, not by the supporting communication system."¹⁷

UNNECESSARY CONCERN?

Is the concern over increased centralization of command valid? Will the integration of advanced C4 systems in the battlespace yield a deterioration of **Auftragstaktik**? There are some who argue that the claims of technology devotees are

illusory, insisting instead that the entire paradigmatic shift is ill-conceived. "Overly optimistic and inappropriate" are the words chosen by Naval War College professor Warren Caldwell to characterize those advocates.¹⁸ For a variety of reasons--poor assumptions and an ignorance of resource availability among them--he argues that we have overestimated our ability to achieve DBA, and must therefore scale back our expectations regarding the performance of advanced C4 systems.

"From Plato to NATO, the history of command in war consists essentially of an endless quest for certainty..."¹⁹ Martin Van Creveld shares Caldwell's pessimism, though for different reasons. Based on historical analysis, Van Creveld proposes that man continues to demonstrate no aptitude for clearing the fog of war, nor handling the increased flow of information that accompanies advanced communications systems. If this is so, perhaps the fears of overly centralized command are baseless, and little will be changed in the 21st century.

It may also be the case that, with the increased availability of information, an Operational Commander simply will not have the time to become involved in matters on a lower level. Van Creveld's 'pathology of information' is instructive here: the need for additional knowledge fosters greater information flow, a larger staff to manage that flow, and additional requests for information as omniscience is sought. Advanced C4 systems might simply worsen the very situations they seek to ameliorate.

Finally, is it even appropriate to speak in terms of existing command hierarchies when considering implementation doctrine for advanced C4 systems? Integration of computer-based

technology may dictate 'flatter' structures which complement an enhanced horizontal communications connectivity; such a paradigmatic change might require the development of fundamentally different implementing doctrine altogether. Task-oriented orders were designed with vertically integrated systems in mind. A more horizontal command structure may not lend itself to doctrine designed for its antecedents.

CONCLUSION

Though the Joint Chiefs of Staff and individual service branches are not as sanguine as others regarding the performance potential of advanced technology, they are clearly committed to its integration in the 21st century battlespace. With respect to command and control, the doctrine which will be used to implement that technology is focused on continued adherence to decentralized execution (task-oriented orders). But is written doctrine sufficient? The Navy in particular has a long history of disdain for doctrine. What can be done to ensure adherence to it?

Through their Battle Command Battle Laboratory and Commandant's Warfighting Lab programs, the Army and Marine Corps respectively are taking positive measures to test the integration of advanced C4 systems under simulated combat conditions. Along the way, they are changing and developing the doctrine which smoothes that integration. The Navy and Air Force can learn much from this example, constructing their own developmental programs and focusing them on similar goals. That existing doctrine might be proven entirely bankrupt in the process should not be viewed negatively; the opportunity to formulate effective doctrine should instead be welcomed.

The validity and applicability of **Auftragstaktik** is timeless; this will surely emerge from any of the battlefield tests. Should the C4 technology of the 21st century match the expectations held by its proponents, tactics-oriented orders will serve to avert micromanagement from above, or provide direction at the tactical level when the Operational Commander is flooded with information. Conversely, failure of the new equipment, which leaves that same commander and his subordinates with flawed or outdated information, is also overcome through flexible guidance. This provides a tactical warrior with enough latitude to overcome the fog characteristic of battle since prehistoric times.

NOTES

¹ Joint Chiefs of Staff, *C4I For The Warrior*, (Washington: GPO, 1994) 12 [emphasis added].

² Mazarr, Michael J. et. al., *Military Technical Revolution: A Structural Framework*, (Washington: CSIS, 1993) 38.

³ Joint Chiefs of Staff, Joint Pub 6-0, *Doctrine for Command, Control, Communications, and Computer (C4) Systems Support to Joint Operations*, (Washington: GPO, 1995) II-12.

⁴ *Ibid*, II-1.

⁵ Eliot A. Cohen, "A Revolution in Warfare," *Foreign Affairs*, March/April 1996, 50.

⁶ Martin Van Creveld, *Command in War*, (Cambridge: Harvard U. Press, 1985), 169.

⁷ James R. Fitzsimonds and Jan M. Van Tol, "Revolution in Military Affairs," *Joint Force Quarterly*, Spring 1994, 29.

⁸ For a discussion of the development of Stormtroop tactics, see: Bruce I. Gudmundsson, *Stormtroop Tactics*.

⁹ Naval Doctrine Command, *Naval Doctrine Publication 6: Naval Command and Control*, (Washington: GPO, 1995), 42 [emphasis in the original].

¹⁰ U.S. Army Training and Doctrine Command, TRADOC Pamphlet 525-5, *A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century* (Fort Monroe, VA: U.S. Army Training and Doctrine Command, 1994), 3-4 [emphasis in the original].

¹¹ A demand pull system is one which is accessible enough to all subscribers to allow information on request; rather than having a superior organization determine the need for specific data, the decision is made at a lower level, and the information is 'pulled' through the internet system.

¹² TRADOC Pamphlet 525-5, 4-4.

¹³ Headquarters, U.S. Marine Corps, *FMFM 1: Warfighting*, (Washington: GPO, 1989), 62.

¹⁴ Joint Chiefs of Staff, *Joint Vision 2010*, (Washington: GPO, undated), 15 [emphasis added].

¹⁵ *Ibid.*, 27.

¹⁶ Joint Chiefs of Staff, Joint Pub 1, *Joint Warfare of the Armed Forces of the United States*, (Washington: GPO, 1995), III-10.

¹⁷ Joint Chiefs of Staff, Joint Pub 3-0 *Doctrine for Joint Operations*, (Washington: GPO, 1995), II-17.

¹⁸ Warren Caldwell, Jr., "Promises, Promises," *U.S. Naval Institute Proceedings*, January 1996, 54.

¹⁹ Martin Van Creveld, *Command in War*, (Cambridge: Harvard University Press, 1985), 264.

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